

Beyond the Golden Gate—Introduction

Herman A. Karl and Edward Ueber

The beauty and power of the ocean fascinate many people. The sea has been a source of sustenance, recreation, contemplation, and inspiration, as well as a challenge for exploration and discovery, for mankind since prehistory. Although much has been discovered and reported about them, the sea, the life in the sea, and the landscape beneath the sea continue to be largely shrouded in mystery. Despite the fact that the oceans occupy 71 percent of the Earth's surface and are crucial to our survival, we invest more in learning about other planets than we invest in learning about the world beneath the sea.

Perhaps more than any other open space remaining on our planet, the oceans are a common-use area for both work and play for much of the world's population. This observation is particularly true in those areas of the coastal ocean off major urban complexes. In these multiuse "urban oceans," environmental and ecological concerns must be balanced against the human, economic, and industrial demands of adjacent large population centers. With ever-increasing stress being placed on the ecosystems of the oceans by human activities, many areas of the oceans around the United States have been designated as protected sanctuaries and reserves. Three contiguous National Marine Sanctuaries—Cordell Bank, Gulf of the Farallones, and Monterey Bay—stretch more than 300 km (185 mi) from Bodega Bay north of San Francisco to Cambria south of Monterey (fig. 1). They protect an area larger than the States of Connecticut and Rhode Island combined, about 18,000 km² (7,000 mi²) of the California coastal ocean.

The U.S. Geological Survey (USGS) began a major geologic and oceanographic study of the Gulf of the Farallones in 1989. This investigation, the first of several now being conducted adjacent to major population centers by the USGS, was undertaken to establish a scientific data base for an area of 3,400 km² (1,000 square nautical miles) on the Continental Shelf adjacent to the San Francisco Bay region. The results of this study can be used to evaluate and monitor human impact on the marine environment.

In 1990, the project expanded in scope when the USGS sponsored a multidisciplinary investigation with four other Federal agencies—Environmental Protection Agency, Army Corps of Engineers, U.S. Navy, and Gulf of the Farallones National Marine Sanctuary (part of the National Oceanic and Atmospheric Administration)—to survey and sample the Continental Slope west of the Farallon Islands. This study was primarily designed to provide information on the location and distribution of approximately 47,800 containers of low-level radioactive waste and obtain data on areas being considered as potential sites for the disposal of sediments dredged from San Francisco Bay.

Many other organizations eventually participated in this work, including Point Reyes Bird Observatory, California Department of Health Services, and the British Geological Survey. The information from these studies is being used by the Gulf of the Farallones National Marine Sanctuary to better manage and protect the unique ecological resources of the gulf. This information was also used in 1994 by the Environmental Protection Agency in designating the first deep-ocean disposal site for dredged material on the Pacific coast of the United States, west of San Francisco on the Continental Slope outside the boundaries of the sanctuary.

This USGS Circular endeavors to pull back the shroud of mystery that covers the ocean waters seaward of the Golden Gate, revealing to the reader some of the diverse habitats and ecosystems in the Gulf of the Farallones and discussing issues of contamination and waste

disposal. The sections of this book cover the topics of Oceanography and Geology, Biology and Ecological Niches, and Issues of Environmental Management in the Gulf of the Farallones.

The chapters in the paper version of the book are short, less technical summaries. The full chapters are contained on the CD-ROM in the pocket at the back of the book. Links to the complete Circular and related topics can be found at <http://walrus.wr.usgs.gov>.

Acknowledgments.—The view of the Gulf of the Farallones presented here resulted from the efforts of scores of people over a 12-year period, from the first sampling and surveying cruise in 1989 to final publication of this book in 2001. It is not possible to single out each person who contributed in one way or another to this endeavor. The work of each is greatly appreciated, but some deserve special mention. William Schwab, David Twichell, David Drake, and David Rubin served as co-chief scientists with John Chin and Herman Karl on the 1989 and 1990 cruises and contributed significantly to their design and implementation. William Danforth and Thomas O'Brien led the teams that processed sidescan-sonar data in near-real time while at sea. Arthur Wright of Williamson and Associates provided helpful insights during the search for barrels of radioactive waste using the SeaMARC1A sidescan sonar. Pat S. Chavez, Jr., and his group did preliminary computer enhancements of sidescan images that helped identify nongeologic features on the sea floor, such as radioactive waste barrels. John Penvenne of Triton Technologies developed the principal methodology to detect barrels and classify objects in the SeaMARC1A imagery. Kaye Kinoshita and Norman Maher supported the early stages of assembling this book. William van Peeters coordinated the use of the U.S. Navy's DSV *Sea Cliff* and Advanced Tethered Vehicle. The USGS Marine Facility in Redwood City, California, provided operational support on shore and at sea. The officers and crews of the USGS ship R/V *Farnella*, NOAA ship R/V *McArthur*, the Navy's ship *Pacific Escort*, and the support vessel *Laney Chouest* greatly aided the work in the gulf.

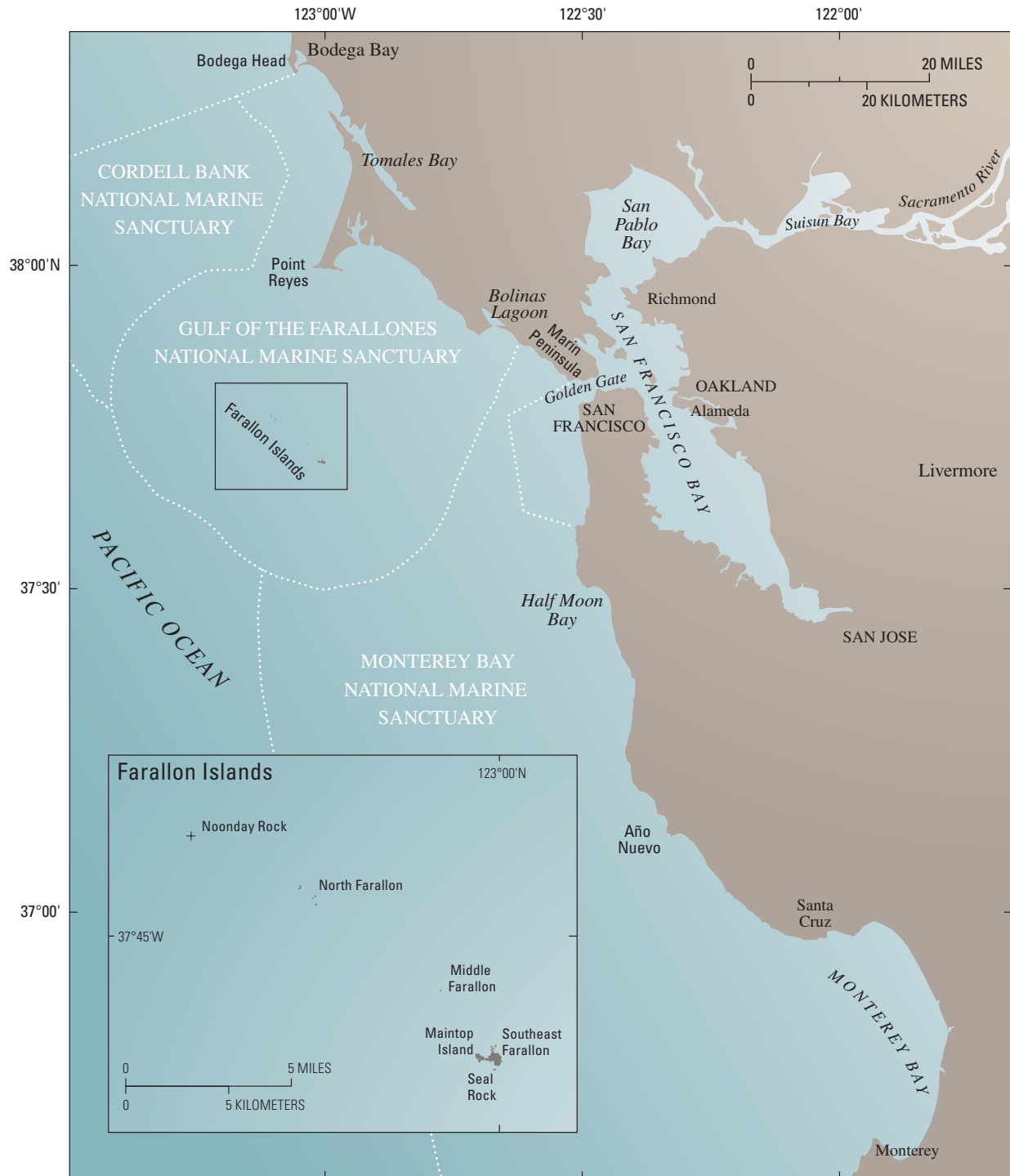


Figure 1. Map of the San Francisco Bay Region and the Gulf of the Farallones.